Molecular Report – Wheat AVT Trials (2025–26)

Molecular profiling of the final-year Advanced Varietal Trial (AVT) wheat entries was conducted during the 2025–26 crop season under the AICRP on Wheat & Barley to assess genetic diversity and molecular relationships among elite wheat breeding materials. The study comprised 68 wheat genotypes, including 53 bread wheat (*Triticum aestivum*) genotypes consisting of 22 AVT entries and 31 check varieties, and 15 durum wheat (*Triticum durum*) genotypes comprising 12 AVT entries and 3 check varieties. Genotyping was performed using 50 PCR-based molecular markers, including 40 Simple Sequence Repeat (SSR) markers and 10 Sequence Tagged Site (STS) markers (Table 1) distributed across different regions of the wheat genome. A total of 106 alleles were amplified across the genotypes, providing adequate polymorphism for assessing genetic relationships and differentiating among the evaluated breeding materials. Genetic similarity among the genotypes was estimated using a similarity coefficient, and cluster analysis was performed using the Unweighted Pair Group Method with Arithmetic Mean (UPGMA).

The molecular analysis revealed moderate to high levels of genetic variation among the evaluated genotypes. The similarity coefficient ranged from 0.59 to 0.99 in bread wheat (Fig.1) and from 0.61 to 0.99 in durum wheat (Fig.2), indicating the presence of closely related as well as genetically diverse genotypes. The UPGMA dendrogram grouped the bread and durum wheat genotypes into distinct clusters, reflecting differences in their molecular profiles. In bread wheat, VL3040M and VL892 showed a close clustering pattern, whereas VL907 and VL2064 occupied relatively distinct positions within the dendrogram, indicating differences in their molecular profiles. In durum wheat, MACS4146(d) and MACS4147(d) showed a close clustering pattern, whereas the check variety MACS3949(d) formed a separate branch, showing a different clustering pattern from the majority of the evaluated genotypes. HI8858(d) also occupied a separate position in the dendrogram, representing additional diversity within the evaluated durum wheat material. The distribution of check varieties across different clusters reflected their diverse genetic backgrounds and supported their use as reference materials for comparative evaluation of AVT entries. This diversity provides a foundation for maintaining genetic variation among wheat varieties and reducing the risks associated with a narrow genetic base in wheat cultivation.

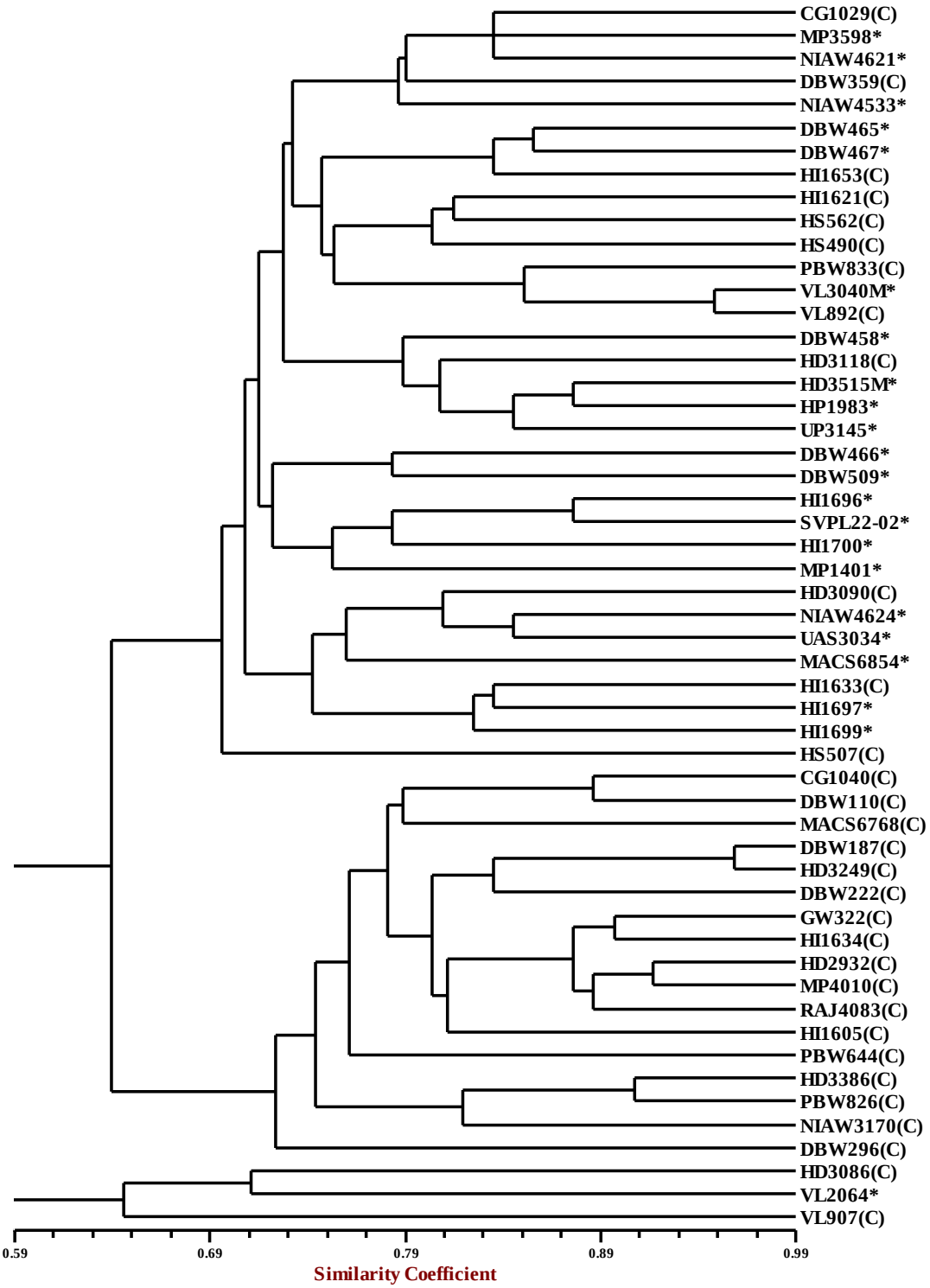

Fig. 1 UPGMA Dendrogram showing clustering pattern among final-year bread wheat AVT entries and check varieties based on SSR and STS marker data.

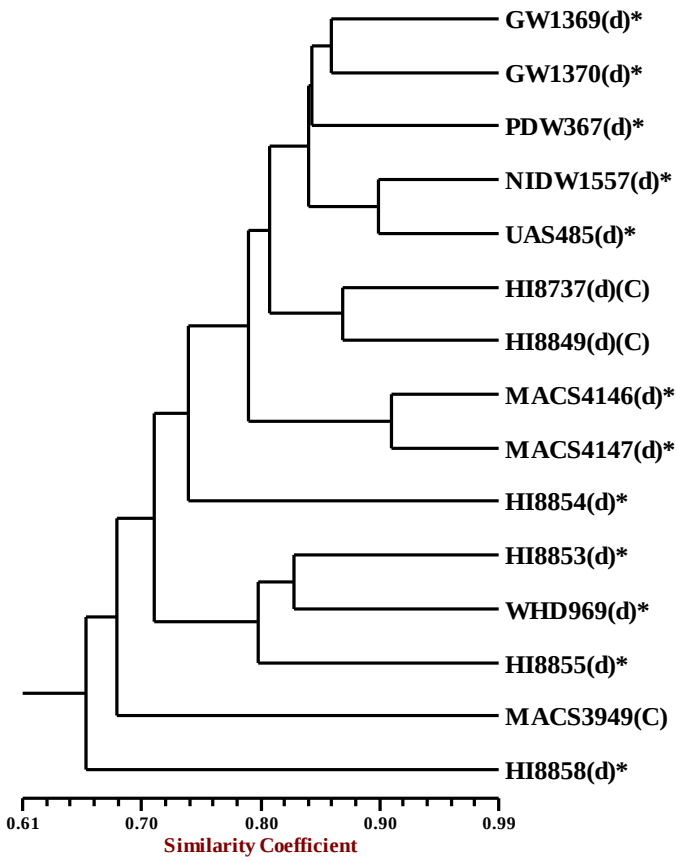

Fig. 2 UPGMA dendrogram showing clustering pattern among final-year durum wheat AVT entries and check varieties based on SSR and STS marker data.

Table1: Profile of the AVT final year entries and checks generated using STS/AS-PCR markers

	Markers	***WxB1***		***DREB***	***Vp1B3***		***Lr10***	***Lr34***		***VrnA1a***	***VrnA1bR2***	***DuPW004***		***Almt***			***RhtB1b***
SNo	**Entries**	**425**	**690**	**700**	**569**	**652**	**300**	**150**	**230**	**965**	**1068**	**250**	**350**	**426**	**706**	**836**	**273**
1	CG1029(C)	+	+	+	+	-	+	-	+	+	-	+	+	-	-	-	+
2	CG1040(C)	+	+	+	+	-	+	-	+	+	-	+	+	+	-	-	+
3	DBW110(C)	+	+	+	+	-	-	-	+	+	-	+	+	+	+	-	+
4	DBW187(C)	+	+	+	+	-	+	-	+	+	-	+	-	+	-	-	+
5	DBW222(C)	+	+	+	+	-	+	-	+	+	-	+	+	+	-	-	-
6	DBW296(C)	+	-	+	-	+	-	-	+	-	-	+	+	+	-	-	+
7	DBW359(C)	+	+	+	+	-	-	-	+	-	-	+	+	+	-	-	+
8	DBW458*	+	+	+	+	-	-	-	+	-	-	+	-	+	+	+	+
9	DBW465*	+	+	+	+	-	+	-	+	-	-	+	+	+	-	-	+
10	DBW466*	+	+	+	+	-	-	-	+	-	+	+	+	+	-	-	+
11	DBW467*	+	+	+	+	-	+	-	+	+	+	+	-	+	-	-	+
12	DBW509*	+	+	+	+	-	-	-	+	-	-	+	-	+	-	-	+
13	GW1369(d)*	+	-	+	+	-	-	-	-	-	-	+	-	-	-	-	+
14	GW1370(d)*	+	-	+	+	-	-	-	-	-	-	+	-	+	-	-	-
15	GW322(C)	+	+	+	+	-	-	-	+	+	-	+	+	+	-	-	-
16	HD2932(C)	+	-	+	+	-	-	-	+	+	-	+	+	-	-	-	+
17	HD3086(C)	+	+	+	+	-	+	-	+	+	-	+	+	+	-	-	-
18	HD3090(C)	+	+	+	+	-	-	-	+	+	-	+	-	-	-	-	+
19	HD3118(C)	+	+	+	+	-	+	-	+	-	-	+	+	+	+	+	+
20	HD3249(C)	+	+	+	+	-	+	-	+	+	-	+	-	+	-	-	+
21	HD3386(C)	+	+	+	+	-	+	-	+	+	-	+	+	-	+	-	-
22	HD3515^{M*}	+	+	+	+	-	-	-	+	-	-	+	+	+	-	-	+
23	HI1605(C)	+	+	+	+	+	-	-	+	-	-	+	+	+	-	-	+
24	HI1621(C)	+	+	+	+	-	+	-	+	-	-	+	+	+	+	-	+
25	HI1633(C)	+	+	+	+	-	+	+	-	-	-	+	+	-	-	-	+
26	HI1634(C)	+	+	+	+	-	+	-	+	+	-	+	+	-	-	-	+
27	HI1653(C)	+	+	+	+	-	+	-	+	+	-	+	-	-	-	-	+
28	HI1696*	+	-	+	+	-	-	-	+	-	+	+	+	+	-	-	+
29	HI1697*	+	-	+	+	-	-	+	-	-	+	+	+	+	-	-	+
30	HI1699*	+	-	+	+	-	-	-	+	-	+	-	+	+	-	-	+
31	HI1700*	+	-	+	+	-	+	-	+	-	+	+	+	+	-	-	+
32	HI8737(d)(C)	+	+	+	-	+	NA	-	-	NA	-	+	-	+	-	-	-
33	HI8849(d)(C)	+	+	+	+	-	NA	-	-	NA	-	-	-	+	-	-	+
34	HI8853(d)*	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
35	HI8854(d)*	-	-	+	+	-	-	-	-	+	+	+	-	+	-	-	+
36	HI8855(d)*	+	-	-	-	-	-	-	-	-	-	-	-	+	-	-	+
37	HI8858(d)*	-	-	+	+	-	-	-	+	-	-	+	-	+	-	-	+
38	HP1983*	+	+	+	+	-	-	+	+	-	-	+	+	+	-	-	+
39	HS490(C)	+	+	+	+	-	+	-	+	-	-	+	-	+	+	-	-
40	HS507(C)	+	+	+	+	-	-	-	+	-	-	+	+	+	+	-	+
41	HS562(C)	+	+	+	+	-	+	-	+	-	-	+	+	+	-	-	+
42	MACS3949(d)(C)	+	+	+	+	-	NA	-	-	NA	-	+	-	-	-	-	+

43	MACS4146(d)*	+	-	+	+	-	-	-	-	-	+	+	-	+	+	+	+
44	MACS4147(d)*	+	-	+	+	-	-	-	-	+	+	+	-	+	+	+	+
45	MACS6768(C)	+	+	+	+	-	-	-	+	-	-	+	+	+	-	-	+
46	MACS6854*	+	-	+	+	-	-	-	+	-	-	+	-	+	-	-	+
47	MP1401*	+	+	+	+	-	-	-	+	-	+	+	-	+	-	-	+
48	MP3598*	+	-	+	+	-	+	-	+	+	-	+	+	+	+	+	+
49	MP4010(C)	+	+	+	+	-	-	-	+	-	-	+	+	-	-	-	-
50	NIAW3170(C)	+	+	+	+	-	+	-	+	+	-	+	+	+	-	-	+
51	NIAW4533^{Q}*	+	-	+	+	-	+	-	+	-	-	+	+	+	-	-	+
52	NIAW4621*	+	-	+	+	-	+	-	+	-	-	+	+	+	+	+	+
53	NIAW4624^{Q}*	+	+	+	+	-	+	-	+	-	+	+	-	+	+	-	+
54	NIDW1557(d)*	+	-	+	+	-	-	-	-	-	-	+	-	+	-	-	-
55	PBW644(C)	+	+	+	+	-	-	+	-	-	-	+	+	+	-	-	+
56	PBW826(C)	+	+	+	+	-	+	-	+	+	+	+	+	+	-	-	+
57	PBW833(C)	+	+	+	+	-	+	-	+	-	-	+	-	+	-	-	+
58	PDW367(d)*	-	-	+	+	-	-	-	-	-	-	+	-	+	-	-	-
59	RAJ4083(C)	+	+	+	+	-	+	+	-	-	-	+	+	+	-	-	+
60	SVPL22-02*	+	+	+	+	-	+	-	+	-	-	+	+	+	-	-	+
61	UAS3034*	+	-	+	+	-	-	-	+	-	+	+	-	+	+	-	+
62	UAS485(d)*	+	-	+	+	-	-	-	-	-	-	+	-	+	-	-	+
63	UP3145*	+	+	+	+	-	+	-	+	-	-	+	+	+	-	-	+
64	VL2064*	+	+	+	-	-	+	+	-	-	-	+	-	+	-	-	+
65	VL3040M*	+	+	+	+	-	+	+	-	-	-	+	-	+	-	-	+
66	VL892(C)	+	+	+	+	-	+	+	-	-	-	+	-	+	-	-	+
67	VL907(C)	+	+	+	+	+	+	+	-	-	-	+	+	+	+	+	+
68	WHD969(d)*	+	-	-	-	-	-	-	-	-	-	-	-	+	+	-	+